



THE ROLE OF VOLUNTEER MONITORING IN TMDLs

SESSION INFORMATION:

Moderator:

Sharon Clifford, Missouri Department of Natural Resources

Presenters:

Scott Kishbaugh, NYSDEC Division of Water
Volunteer Monitoring and Government Environmental Data Reporting: Smooth Fit or Square Peg in Round Hole?

Donna Meyers, Coastal Watershed Council
Volunteer Monitoring and TMDLs: San Lorenzo River Watershed Case Study

Scott Dye, Sierra Club
Chicken Little, Lightbulbs, and the Green Equation
(no paper submitted)



THE ROLE OF VOLUNTEER MONITORING IN TMDLs

Volunteer Monitoring and Government Environmental Data Reporting: Smooth Fit or Square Peg in Round Hole?

CONTACT INFORMATION

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Government, whether federal, state, or local, is frequently charged with the responsibility of evaluating and reporting on the state of environmental resources, whether mandated through the Clean Water Act (305b, 303d), through the need to develop scoring systems for grant programs, or to best inform the public as to conditions necessitating management, restoration, or preservation. While some of these processes are occasionally satisfied by a loose coalition of best professional judgment, generic models, educated guesswork, and political pressure, it is more frequently and most efficiently driven by sound environmental data. Given that most of these government entities are continuing to struggle to bridge broadening data gaps with limited resources, there appears to be a logical need to utilize other data sources to fill these gaps. Some have been filled with the efforts of the academic and professional consulting community, but these are frequently limited to basic research or solving and resolving specifically directed management questions, not assessing ambient environmental conditions and linking use of and problems associated with these resources. Increasingly, volunteer monitoring is being looked at as a way to fill some of these gaps.

New York State is one of an increasing number of states that taps into the potential uses of volunteer monitoring data. It incorporates these data into a wide variety of assessment and management programs, from delineating priorities for state funding programs (such as the New York Clean Air/Clean Water Bond Act) to serving federal reporting requirements of sections 305b and 303d of the Clean Water Act. It also determines the most appropriate use of state sampling resources, management efforts, and other expenditures of a limited resource base. This paper focuses on the information-to-action process that utilizes volunteer monitoring data in the development of the federal 305b and 303d lists, which serve as the roadmap for more effectively assessing, restoring, and protecting water resources throughout the state and country. The connection between volunteer monitoring data and the development of management tools for water resource impairments, such as total maximum daily load (TMDL) calculations, is also addressed in this paper. Although multiple sources of volunteer monitoring data are included within this discussion, the focus of this paper will be on the use of monitoring data collected within the New York Citizens Statewide Lake Assessment Program (CSLAP), a lay monitoring program conducted by the NYS Department of Environmental Conservation (NYSDEC) and the NY Federation of Lake Associations, (a coalition of not-for-profit shorefront property owners groups, fish and game clubs, lake protection groups, local taxing districts and interested individuals dedicated to the protection and preservation of New York State lakes and ponds.)

As in many states, the information-to-action pipeline in New York State starts with a waterbody inventory to assess and evaluate the state of water resources, with an emphasis on identifying conditions that result in an impairment to a wide variety of water uses. Unlike many other states, New York State compiles a statewide inventory of waterbodies that provides assessment endpoints that differ somewhat from the federal reporting requirements promulgated in section 305b of the Clean Water Act (the "305b Reports"), as noted in Figure 1. This additional layer of assessment categories is required to encompass an interpretation of traditional water quality data and less technical information needed to develop such things as: scorecards for broadly assessing waterbody conditions for triggering additional monitoring activities; scoring systems for grant programs; evaluating water quality problems not necessarily linked to use impairments (such as violation of some "lesser" water quality standards); and building momentum toward the identification of problems, sources, and improvements in an expanding number of waterbodies throughout the state.

Within the waterbody inventory, compiled information can be categorized as water quality data (physical, chemical, and biological), biota identification and/or counts, anecdotal information and public perception as pertinent to waterbody uses, and user endpoint information, such as beach closures and generic fish consumption advisories. Each of these categories are often host to a full spectrum of data intensity, from single data points or a few residential complaints to comprehensive water quality studies. In addition, the robustness of these datasets is further iterated by the validity of analytical tools used to generate the water quality data. In New York State, state certified labs must be utilized for analyzing data from any state (directly or indirectly via counties or other local government) funded programs, and the validity of sample collection and analyses must be assured through the development of quality assurance plans (QAPs). This requirement has resulted in generally dividing water monitoring programs in NYS into various levels of documentation and richness of data. The New York State Waterbody Inventory includes

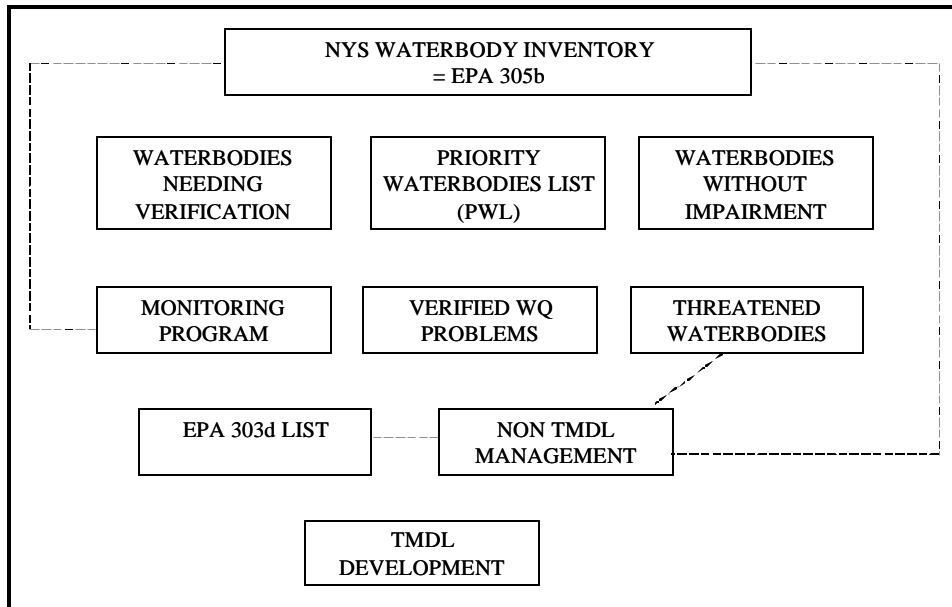


Figure 1. NYS Assessment Endpoints.

listings for a wide variety of both data-rich and data-sparse waterbodies; the data-intensive subset of the inventory, as defined by the intensity of the data collection and validity, serves as the focus for the federal 305b reports generated by the NYSDEC.

Specifically, these assessments identify impacted lakes for inclusion on the state Priority Waterbody List (PWL), a subset of the waterbody inventory that serves as the primary focus for management activities and expenditures sanctioned by the NYSDEC. Water quality assessments within the PWL identify the severity of impairment and level of documentation for specific uses consistent with the broad federal goals of “swimmable, fishable” waterbodies and other common uses of lakes, reservoirs, and streams: water supply, shellfishing, public bathing, fish consumption, aquatic life (i.e. fish survival), recreation (non-contact recreation, such as boating), and aesthetics. The severity of impairments are categorized as **precluded** (frequent or persistent conditions preclude all aspects of use), **impaired** (occasional conditions periodically prevent/limit/restrict use or persistent conditions discourage use), **stressed** (occasional conditions periodically discourage use), and **threatened** (use supported but is threatened by changing land use, water quality degradation or is a highly valued resource). The level of documentation can be categorized as **known** (data/studies completed and provide conclusive evidence), **suspected** (anecdotal evidence, public perception, some data suggest conclusion, but studies are incomplete or there exists conflicting information), and **possible** (very little documentation exists of actual water quality problems). Numeric and non-quantitative (professional judgment) criteria exist for assigning waterbodies into these use impairment criteria. Table 1 connects assessments developed for the PWL with the federal 305b reporting requirements, based on the level of documentation.

Table 1. PWL assessments and the federal 305b reporting requirements.

Severity of Problem (NYS PWL Category)	Known Problem (EPA 305b Category)	Suspected Problem (EPA 305b Category)	Possible Problem (EPA 305b Category)
Precluded	Not Supporting	Not Applicable	Not Applicable
Impaired	Partially Supporting	Partially Supporting	Not Applicable
Stressed	Supporting but Threatened	Supporting but Threatened	Fully Supporting (needs verification)
Threatened	Supporting but Threatened	Fully Supporting	Fully Supporting (special protection)

So where does that leave volunteer monitoring programs? Many volunteer monitoring programs collide with the professional monitoring and assessment community that is often dually charged with conducting monitoring



programs and evaluating data collected by both trained professionals and interested laymen. For water quality and biota data, volunteer data are often perceived to be limited by available equipment, analytical tools, and collection, identification, and interpretation expertise. This tends to negatively affect volunteer stream data more than lake data, since the former rely heavily on “identification” data (such as macroinvertebrates), while the latter often rely on sampling equipment (Secchi disks) that are compatible across monitoring programs. In addition, lake monitors more often utilize laboratories for analyzing sensitive chemical constituents (such as low level phosphorus) not accurately analyzed with test kits or field tests, whereas stream monitors are often evaluating constituents (such as dissolved oxygen and pH) that are readily analyzed via test kits or other testing procedures modified from more detailed or technically accepted methodologies. While readily available kits and field tests have resulted in great expansions in volunteer monitoring, they may also have highlighted a perceived contrast between professional and lay collection of water quality data, resulting in skepticism in the use of volunteer data for some government functions. This gap continues to narrow, however, as volunteer monitoring programs become more sophisticated (read standardized) and fewer agency resources are dedicated to monitoring.

An increasing number of monitoring programs are collecting use perception data (via standardized field observation forms). Local volunteers may be perceived as more effective in evaluating use impairments, since they are also local users of these resources, they maintain a close physical proximity to evaluated (and changing) conditions, and they maintain a greater sense of acceptable and “normal” water quality conditions for nearby waterbodies. As a result, the increasing use of perception data has served to positively affect volunteer lake data, since standardized perception forms have been effectively utilized by several states (Minnesota, Vermont) in developing water quality standards, and since many of the uses targeted for assessment, at least in New York State, are practiced far more commonly in lakes than in streams (such as bathing and boating).

In New York State, there is only one state-conducted volunteer monitoring program. CSLAP involves rigid individual volunteer training (by NYSDEC staff), uses standardized sampling protocols and equipment consistent with that used in state agency “professional” monitoring programs, has an approved QAP, and all pertinent samples are analyzed by a state certified laboratory (the NYS Department of Health). The level of documentation, depending on the nature of the uses assessed, can be categorized as high as “known” or “suspected,” using the vernacular described above. These data feed directly into the state PWL process (through input from NYSDEC-CSLAP staff) and, based on the matrix above, can feed directly into the 305b process. Moreover, in some use impairment categories, such as aesthetics and public bathing, the biweekly public perception data collected through CSLAP is probably a more accurate assessment of use conditions than less localized monthly monitoring data collected in more traditional (“professional”) ambient lake monitoring programs. Such assessments may be useful in supplementing more quantifiable water quality monitoring data collected within CSLAP or other traditional monitoring programs.

The NYSDEC has also been working with the Hudson Basin River Watch (HBRW) program, a project of Open Space Institute, Inc. connected with the national River Network and developed to improve the water quality of the Hudson River basin through education, community involvement, and stewardship. HBRW coordinates a number of volunteer monitoring programs within the Hudson River basin, and is developing a standardized water quality monitoring protocol for use in each of these sub-basin monitoring efforts. Once this protocol is completed and adopted by the individual monitoring programs, data collected in these programs will be “upgraded” into a higher category of documentation and will become eligible for inclusion in the state PWL and federal 305b listing processes. This process has already come to fruition for some of the individual programs already well integrated within the HBRW network.

The balance of the volunteer monitoring programs in New York State (at least 25 other programs, according to EPA) generally do not have approved QAPs, often do not utilize certified laboratories (although many collect macroinvertebrate data or other information not amenable to laboratory analyses), and may not use standardized sampling protocols or have other means for verifying the validity of the data generated within the program. As such, the documentation associated with these programs would most likely be categorized as “suspected” or “possible” and thus might not be eligible for characterization through the federal 305b listings or even the state PWL listings, even if sampling results yielded assessments comparable to those through these more verifiable monitoring programs.

An example to illustrate this could be fictitious Lake Luster, a Class B (best intended use = public bathing) lake with a public swimming beach. Water quality data collected in three monitoring programs (Agency Ambient Monitoring Program, State-Sponsored Citizens Monitoring Program [CSLAP], and Unsponsored Volunteer Monitoring) all indicate water clarity readings of 1.8 meters and total phosphorus concentrations of 0.040 mg/L, and there are no records of any beach closures. In addition, the State-Sponsored Citizens Monitoring Program perception data indicates that swimming is impaired 40% of the summer.



The assessment of the lake by the Agency monitoring staff, utilizing agency data collected with standardized equipment and procedures and utilizing certified laboratories, would indicate that water clarity readings suggest *threatened* conditions, nutrient data suggest *stressed* conditions, and the lack of beach closures suggest *stressed*, *threatened*, or *non-threatened* conditions. The overall assessment would likely be either *threatened* or *stressed* for public bathing, contingent on other data (bacteriological) and staff evaluation of the relative importance of each indicator.

An assessment of the lake using State-sponsored citizen monitoring data would indicate the same level of impairment, since these data would also be considered **known** (using the criteria described above) and, at least for these purposes, comparable to that collected by the Agency staff. However, since the volunteer data set also includes perception data, which would indicate that the lake may be *stressed*, the overall assessment of the lake may be tipped toward *stressed* conditions.

Meanwhile, assessing the lake using Un-sponsored volunteer monitoring data may not indicate the same level of impairment, since no QAP exists to indicate whether, for example, water clarity measurements are collected in sufficiently deep water to accurately assess the transparency, or if phosphorus results are analyzed and/or reported in sufficient accuracy to know if a reading of 0.040 mg/L is more accurately reported as 0.04 mg/L or even 0.04 ± 0.02 mg/L. These data may not be sufficient to place this waterbody on the state PWL list, and are unlikely to be adequate for inclusion on the federal 305b list. Instead, this may be a lake that requires verification before inclusion on any reporting list.

The data requirements for inclusion on the PWL listing, as noted above, are not as stringent as those required for the federal 305b list. These, in turn, may be even less stringent than those required for inclusion on the federal 303d list, since the latter usually triggers a rigorous assessment of pollutant sources (via TMDL calculations) and ultimately large-scale management and remediation of the problems causing the original impairment. There may be some potential 303d list candidates (based on the level of impairment identified in the 305b list) for which non-TMDL management may be more appropriate. Some examples of this may include waterbodies managed through remediation of a specific or single source, those with historical or legacy (no contemporary loading) pollutants, and waterbodies with problems associated with “natural” conditions. There may also be classes of TMDL candidate waters in which a generic TMDL may be appropriate, such as culturally (atmospherically) acidified lakes, which make up a large percentage of the non-supporting lakes in New York State. The balance of the non- and partially-supporting waterbodies on the 305b list may be candidates for site-specific TMDLs.

As in many states, the TMDL development process in New York State is evolving to balance the need to better manage the impacted water resources of the state with the technical, fiscal, and logistic difficulties in developing these loading calculations and management strategies. New York State identified five priority waterbodies/basins for TMDL development in 1998: New York Harbor, Long Island Sound, the New York City Watershed (referring to reservoirs and their basins north of the City that supply drinking water to City residents), Lake Champlain, and Onondaga Lake. Many of these priority basins have been the subject of intensive agency, academic, and other professional monitoring for many years (hence the development of the database to support the prioritization of these management strategies) and thus have not relied heavily on volunteer data. However, several lakes within these priority basins have been identified as candidates for individual TMDLs based largely on volunteer monitoring data, and the TMDL process in Lake Champlain has relied heavily on volunteer data (collected primarily in Vermont) for assessing ambient conditions and for the development of nutrient criteria and standards inherent in the TMDL calculations. New York State has also identified four secondary priority TMDL categories related to atmospheric deposition lakes, fish consumption advisories, closed shellfishing waters, and monitoring standards violations that will increasingly rely on volunteer monitoring data to support existing limited databases, and to direct future professional monitoring efforts.

It is likely that the role of volunteer monitoring data in the TMDL process will involve the following components of the existing TMDL regulations and guidance:

- *Forming Monitoring Partnerships* with agencies, academic, and local citizens
- *Supporting Load Allocation Calculations* that require ambient water quality data for mass balances and loading data at inlets. These data are already collected by volunteers in many priority and emerging priority basins
- *Enhancing 305b and 303d Lists*, since states have been charged by EPA to develop more comprehensive lists. Volunteer data can supplement this by providing information to move waters from the 305b to 303d



lists, particularly as the monitoring programs become more sophisticated (read standardized) and accepted as valid data generators

- *Assessment of Water-Based Control Actions* that require ambient water quality information for evaluating the effectiveness of TMDLs. As noted above, volunteer data are particularly effective at evaluating attainment of uses
- *Verifying Models* developed to evaluate post-TMDL activities for continuing or future water quality conditions.



THE ROLE OF VOLUNTEER MONITORING IN TMDLs

Volunteer Monitoring and TMDLs: San Lorenzo River Watershed Case Study

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Background

The San Lorenzo River drains a 137 square mile watershed comprised of approximately 22,000 acres.

The watershed is characterized by rural residential development and supports land uses including timber harvesting, mining, and recreation in the form of state and county parks. The San Lorenzo River watershed is characterized by steep topography; deeply weathered, sandy and easily eroded geologic formations; and moderately high, periodically intense, periods of rainfall.

Studies dating back to the 1940s have documented impairment of channel bed conditions for aquatic habitat resulting from excessive sand and silt being transported through the local stream system. Over the last 60 years, human activity has accelerated the erosional processes in the watershed through road building, wet season use of unsurfaced roads, drainage modifications on hillslopes and along road corridors, land clearing for residential and commercial development, timber harvest activities, removal of riparian vegetation and past channelization efforts.

The San Lorenzo Watershed was listed as an impaired watershed by the Central Coast Regional Water Quality Control Board in 1994. The watershed was listed for both sediment and nutrient pollutants. Sedimentation is documented as impairing defined beneficial uses including: cold water fisheries, spawning and rearing habitat, water supply, and body-contact recreation. The listing of the San Lorenzo River as an impaired waterway (Clean Water Act, Section 303d) necessitates water quality improvement through the establishment of a total maximum daily load (TMDL) process for the watershed.

Study Methodology

The San Lorenzo River Sediment TMDL is being developed according to the following methodology:

- Quantitative estimate of sediment loading under theoretical past “unimpaired” conditions
- Quantitative estimate of sediment loading for current watershed conditions
- Focus on representative subwatershed for extrapolation to entire watershed

Investigation Methods and Resources

- Literature review and background data collection including previous water resources and fisheries studies, historic maps and aerial photographs, current digital mapping and imagery, geological and soils studies, and land use plans.
- Assess and Identify Sediment Sources (including point and nonpoint sources)
- Identify natural background erosion vs. human-induced erosion
 1. Road contributions
 2. Landslides and hillslope processes
 3. Stockpiled material
 4. Streambank instability
- Monitor sediment impacts on streambed conditions
- Develop and quantify sediment source ratio for background and anthropogenic sources
- Identify sediment reduction methods through BMPs and other methods
- Develop measurable and achievable numeric targets to monitor changes in watershed conditions and known beneficial uses.



Role of Volunteer Monitoring in TMDL Development and Implementation

The Coastal Watershed Council (CWC) participated in the development of the San Lorenzo River Sediment TMDL by conducting monitoring of streambed conditions and assessing sediment contributions from public roads. CWC volunteers conducted the following streambed assessments:

- Longitudinal profiles of critical reaches
- Cross-sectional surveys of pool, riffle and run habitat
- Pebble-counts
- Embeddedness surveys
- Public road surveys

Monitoring was conducted at sites previously monitored in 1979 and 1992. Monitoring sites were permanently documented and CWC volunteers will revisit sites on a 3-year rotational basis to assess effectiveness of BMPs on achieving numeric targets for bed conditions including percent fines, embeddedness and pool volume. The value of volunteer monitoring as part of the TMDL program is that sites can be revisited on a regular basis and over a long period of time with limited investment by local agencies.



DEVELOPING A QUALITY ASSURANCE PROJECT PLAN

SESSION INFORMATION:

No individual papers were submitted for this 2-part overview and discussion session

Moderator:

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Presenters:

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The quality assurance project plan (QAPP) is a written document that outlines the procedures a monitoring project will use to ensure that samples collected and analyzed, the data stored and managed, and the reports written are of high enough quality to meet the project's needs. Keep in mind that:

Credibility doesn't mean having the most exacting techniques. It means delivering on your promises, no matter how small or large they are. (Meg Kerr, RI River Rescue)

A QAPP helps a program identify, articulate, and keep its promises. The path toward developing credibility and ensuring quality cannot be successfully navigated without a QAPP that details a project's standard operating procedures in the field and lab, outlines project organization, and addresses issues such as training requirements, instrument calibration, and internal checks on how data are collected, analyzed, and reported. Just how detailed such a plan needs to be depends, to a large extent, on the goals of the project. The 1998 *National Directory of Volunteer Environmental Monitoring Programs* asked program coordinators whether they had a quality assurance project plan. Over 770 groups responded to the survey. Forty-four percent of respondents indicated that they do have such a plan, with 27% reporting that the plan is state-approved, and 18% that it is EPA-approved. As volunteer monitoring



moves into the mainstream, more and more groups will be developing QAPPs to help ensure data of known quality and to enhance the overall credibility of their program.

The QAPP sessions at the Austin conference were designed to provide participants with an overview of the QAPP process and an opportunity to explore issues specific to their own programs. The workshop was broken into two parts:

- Part 1 focused on the overall issue of credibility for volunteer monitoring programs as well as an overview of the elements included in a QAPP. Linda Green gave a presentation titled *Enhancing Credibility in a Volunteer Monitoring Program* and Abby Markowitz presented *The Elements of a QAPP*. Mike Bira served as a resource person. If anyone would like a copy of either of the slide presentations given during this session, please contact Abby or Linda directly (see box).
- Part 2 of the session was an interactive discussion focused on issues and questions raised by participants. This “QAPP Clinic” allowed folks to ask questions and raise issues specific to their programs.

For more information

The following resources can be extremely helpful in developing the foundation for a QAPP, networking with similar programs that have developed QAPPs, and in actually preparing your own QAPP document:

USEPA. 1996. *The Volunteer Monitor's Guide to Quality Assurance Project Plans*. EPA-841-B-96-003.

(Available by contacting EPA's National Service Center for Environmental Publications, at 800/490-9198.

The document is also available on line at <http://www.epa.gov/OWOW/monitoring/vol.html>. This document contains an extensive list of resources and references to help in the journey to preparing a QAPP)

Ely, Eleanor and E. Hamingson. 1998. *National Directory of Volunteer Environmental Monitoring Programs*.

EPA-841-B-98-009. (Available from NSCEP, 800/490-9198. The document is also available online at

<http://yosemite.epa.gov/water/volmon.nsf>. A summary of the Directory's findings is also available online at <http://www.epa.gov/OWOW/monitoring/dir.html>)



EVERYONE INTO THE WATER! ORGANIZING A REGIONAL MONITORING “DAY”

SESSION INFORMATION:

Moderator:

Steven Hubbell, Lower Colorado River Authority

Presenters:

Diane Wilson, Pennsylvania Department of Environmental Protection
Capture the Moment—Pennsylvania’s Watershed Snapshot

Steven Hubbell, Lower Colorado River Authority
Earth Day Monitoring in Texas: From Seed to Harvest

Ken Cooke, Kentucky Water Watch
Communications and Logistics for Lock Step Sampling Events: The KY Watershed Watch Sample Management System
(no paper submitted)



EVERYONE INTO THE WATER! ORGANIZING A REGIONAL MONITORING "DAY"

Capture the Moment - Pennsylvania's Watershed Snapshot

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Introduction

Pennsylvania has a rich history of grassroots volunteer water monitoring. A recent survey by Pennsylvania's Department of Environmental Protection's Citizens' Volunteer Monitoring Program indicates that there are at least 140 groups comprising 11,000 individuals who collectively spend more than \$1,000,000 on monitoring activities. A number of the community based monitoring groups has gone beyond water quality monitoring to restoration activities. The goals and activities of the Citizens' Volunteer Monitoring Program, which was initiated in 1996, are attuned to the goals and needs of the community based monitoring groups. Some of the actions taken by the Citizens' Volunteer Monitoring Program to meet the needs of local groups include: the formation of a statewide Volunteer Environmental Monitoring Panel, an extensive training program tailored to individual groups' goals, and a handbook for community based monitoring. The handbook is unique in that it does not prescribe standardized protocols for all. Instead it advocates the use of a study design process and a choice of monitoring methods appropriate to the goals of the individual group.

The program has partnered with the Environmental Alliance for Senior Involvement, the Pennsylvania Department of Aging and the Pennsylvania Senior Environment Corps on the organization of a stream monitoring program with standardized protocols and a quality assurance project plan for senior citizens. The program has also undertaken an extensive and ongoing study of potential uses of volunteer collected data in state assessments. In addition, the Citizens' Volunteer Monitoring Program plans and implements an annual statewide *Watershed Snapshot* that captures and showcases the massive commitment of Pennsylvania's communities to clean water.

Goals of the Watershed Snapshot

It has been said that Earthday has joined the ranks of the "picnic" holidays with its significance, like that of the Fourth of July and Memorial Day, lost amidst the noise of the fireworks displays and smoke of backyard grills. The original intent of Earthday as envisioned by Gaylord Nelson - then Senator from Wisconsin - was to capture the attention of a nation and bring environmental issues to the forefront. Organized "teach-ins" at concerts and rallies all over the country drummed up grass-roots supporters by the thousands. Environmental legislation such as the Clean Water Act of 1972, which changed the way we view natural resources, followed the first Earthday.

The citizens' volunteer monitoring movement captures the spirit of that first Earthday. Volunteer monitors in Pennsylvania celebrate that spirit with the *Watershed Snapshot*. Thousands of volunteer and professional monitors have participated in this annual event that began as the *Water Snapshot* and became the *Earthday Snapshot of Water Quality* and finally the *Watershed Snapshot*.

The goals of this event are to:

- Promote watershed education and awareness
- Recognize the ongoing efforts of community based water monitoring groups
- Foster the link between community based water monitoring groups and professional monitors
- Promote and strengthen the network of community based water monitors
- Give volunteer monitors the opportunity to showcase their accomplishments in a statewide forum

History

Water Snapshot '96

The idea for a "water snapshot" was born in September 1995 at a meeting hosted by the Delaware Riverkeeper, an umbrella group that provides services to community based monitoring groups throughout the Delaware River Basin (which drains about one third of Pennsylvania, parts of New Jersey, New York and Delaware). The idea was to promote community based water-monitoring programs in the Delaware River Basin. The vision was to have every monitoring program operating in the Delaware River Basin, whether volunteer or not, collect data during the same



time frame. It would run concurrently with Earthday celebrations. This would serve as a massive demonstration of the commitment to clean water in the basin. It would capture the spirit of the moment in a "snapshot" of water quality conditions taken by all those committed to water resources.

Participants would include citizens' groups, schools, colleges, universities, government agencies, water and sewer departments, environmental professionals, anglers, youth organizations, industries and others. Sampling would cover a cross section of the watershed from the mouth where the river enters the Atlantic Ocean to the small head water streams.

Since the participants in *Water Snapshot '96* would range from elementary school children using simple kits and litmus paper to environmental consultants with access to sophisticated sampling and analysis methods, the selection of water quality indicators to be assessed was a critical decision. The technical advisors for *Snapshot* choose a small suite of indicators including air and water temperature, pH, dissolved oxygen, nitrate and phosphate.

The sponsors of the event then developed a single page data sheet that asked for information about the samplers, the sampling location and the weather conditions on the sampling date. All data would be collected between April 20th and April 28th. This afforded volunteer monitors two weekends from which to choose.

An invitation to participate, along with the data sheet, was sent to hundreds of addresses throughout the basin. Participants were asked to complete as much of the requested information as possible. Simultaneously, the sponsors devised a press release and sent it to all news media in the Delaware River Basin and developed a web site dedicated to the event. More than 70 organizations including schools, youth organizations, citizens' groups, private companies and government agencies participated. It was estimated that hundreds of individuals got out to "capture the moment".

Earthday Snapshot of Water Quality 1997

In 1997 the Pennsylvania Department of Environmental Protection initiated a Citizens' Volunteer Monitoring Program. The program planned and implemented *Earthday Snapshot of Water Quality 1997* because of the great success of *Water Snapshot '96* and as an outreach tool to begin establishing a statewide network for Pennsylvania's numerous volunteer water monitors.

The Citizens' Volunteer Monitoring Program collaborated with the sponsors of *Water Snapshot '96* to take the event into the Susquehanna and Allegheny River Basins, two of Pennsylvania's largest watersheds. Technical advisors decided to add past weather conditions, flow, Secchi depth readings and visual accounts of turbidity and aquatic life to the suite of water quality indicators included in *Water Snapshot '96*.

Water quality monitors were asked to go streamside at their routine sampling stations within the April 18-27 time frame. They were asked to use whatever sampling and analysis methods they would normally employ within their monitoring programs.

The project sponsors again developed a single page data sheet that was mailed to potential participants in the Delaware, Susquehanna and Allegheny basins along with press releases to the media. The Delaware River Basin Commission continued to lead the effort in the Delaware River basin with the Citizens' Volunteer monitoring Program taking the lead in the Allegheny and Susquehanna. Personnel from the Citizens' Volunteer Monitoring Program went afield to do "side by side" monitoring with as many groups as possible. Again, participants were asked to fill in only as much of the requested information as possible.

These efforts led to a fantastic increase in the number of participants for the combined monitoring projects. There were well over 1,000 participants in those three basins with a few data sheets coming in from the Lake Erie and Potomac River Basins.

Earthday Snapshot of Water Quality 1998

The *Snapshot* was taken statewide in 1998 to all of Pennsylvania's major basins including Susquehanna River, Delaware River, Ohio River (which includes the Allegheny and Monogahela Rivers) Potomac River and Lake Erie. The Citizens' Volunteer Monitoring Program continued to lead the effort in all basins except the Delaware. The Delaware River Basin Commission continued for their third year in the Delaware. The procedure of data sheet distribution with alerts to the media was similar to the 1997 event.

A visual habitat assessment was added to the suite of physical and chemical indicators. Participants were asked to look at the stream and surrounding area for 50 yards upstream and 50 yards downstream of their site. Then they looked at each of the following factors and rated them as excellent, good, marginal or poor: in-stream cover; fine



particle sediments; condition of banks and coverage; disruptive pressures to riparian area; riparian vegetative zone width; flow patterns and litter. They then gave an overall rating for the visual assessment. Again participation was high, with thousands of individuals taking part.

Earthday Snapshot of Water Quality 1999

Sponsorship and collaboration between the Delaware River Basin Commission and the Citizens' Volunteer Monitoring Program continued in the statewide effort in 1999. The procedure of data sheet distribution with alerts to the media was similar to previous years. Volunteers, and other monitors, went afield during Earth Week - April 17-26. A benthic macroinvertebrate survey was added to the host of indicators assessed in 1998. A simple key for macroinvertebrates and water quality rating guide was distributed with the data sheets for habitat assessment and chemical/physical indicators. Participants were asked to use a kick screen or D-frame net and disturb a streambed area of 1 square meter to collect aquatic macroinvertebrates. Using a modified Hilsenhoff Biological Index, they scored their collections to arrive at an overall water quality rating. Participation numbers decreased slightly in 1999 but participants were extremely enthusiastic about the macroinvertebrate survey.

Watershed Snapshot 2000

Watershed Snapshot 2000 will take place during a two week period from April 14 - 30. The extended time frame would accommodate holiday schedules including Easter and Passover that may effect school monitoring groups in particular. The procedure for this *Snapshot* is similar to those in the past four years. The theme for this year's event is watersheds with a focus on non-point pollution. A land use survey and indicators for abandoned mine drainage, a major source of non-point source pollution, were added to the physical/chemical indicators, habitat assessment and benthic macroinvertebrates survey of past *Snapshots*. The Delaware River Basin Commission continues to lead the effort in the Delaware River Basin with the Citizens' Volunteer Monitoring Program leading the effort in the remaining Pennsylvania Basins.

The Citizens' Volunteer Monitoring Program is partnering with the Alliance for the Chesapeake Bay to organize as many events around *Watershed Snapshot 2000* as possible by holding "*Watershed Snapshot Showcase*" events across the state. The *Showcase* events will run concurrently with the *Snapshot*. The events will be half-day monitoring events at streams or lakes and will include at least one school group or youth organization and a senior citizen group or watershed association to encourage inter-generational activities. At each event there will be a hands-on set of presentations focusing on the four basic monitoring activities of Watershed Snapshot 2000: land-use; macroinvertebrate monitoring; chemical monitoring and habitat assessment.

Snapshot Reports

In all the snapshot events, data sheets are returned to the Delaware River Basin Commission and the Citizens' Volunteer Monitoring Program. The Delaware River Basin Commission compiles a report for their basin. The Citizens' Volunteer Monitoring Program compiles data from all Pennsylvania's watershed into a report that can be used as an educational tool. The data is "democratized" - all data is used without regard to the data quality objectives employed - to develop a "picture" of the overall water quality in Pennsylvania. Also, since participants are asked to complete only as much of the requested information as possible, some data sheets only included information on water temperature and pH whereas others completed all assessments. Despite the disparity in quality control or lack thereof, the data sets for individual indicators contain very few "outliers" and are remarkably consistent within basins and over the years. The data collected is used to get a better picture of the ranges in results that can be expected, as well as determining trends and effects of physical influences upon water chemistry. The reports compiled by the Citizens' Volunteer Monitoring Program are intended to be used as reference tools with each one emphasizing a different aspects of water quality monitoring such as water chemistry factors, aquatic life and habitat. Each edition of the *Snapshot* report is complete in its own right and, at the same time, each edition complements the others. The reports have proven to be remarkably popular with high demand from the public for additional copies.

What Have We Gained?

This annual event has generated tremendous enthusiasm and a feeling of belonging among many of the groups who monitor aquatic resources in Pennsylvania. Some of the volunteer monitoring groups have been quietly going about their watershed stewardship business for as long as 35 years. The event has given them much deserved statewide recognition for their incredible dedication to their watersheds.

Much has happened in the world of volunteer monitoring in Pennsylvania since the inception of the *Snapshot*. The number of known groups has grown from 63 in 1997 to over 140 in 2000. More than 60 groups report they are working with the Pennsylvania Department of Environmental Protection in terms of data usage. Volunteer monitoring has a high profile in the state and the movement is growing all the time in terms of numbers and



credibility. More groups than ever are reporting that they are using habitat assessment and benthic macroinvertebrate surveys as part of their programs. There are plans to formalize a grassroots statewide network of volunteers, which will be initiated at a summit of volunteer monitors later this year. It is difficult to gauge how much of this development has occurred as a result of the *Snapshot*. It certainly has been the catalyst for much of the recognition that the volunteer monitoring movement in Pennsylvania now enjoys.

What Have We Learned?

Here are a few lessons we have learned along the way:

- Have some clear goals and communicate them to potential participants well before the event. We sent out "Save the Date" postcards this year about 2 months prior to the event.
- Encourage "mixed" sampling teams. The *Snapshot* affords a golden opportunity for volunteers and professionals to monitor side by side. We have much to learn from each other.
- Keep it simple and decentralize, decentralize, decentralize!! The philosophy is that ANYONE can participate in the *Snapshot*. Keep the data sheets simple. Everyone monitors at their routine stations or in their backyard if they like. Don't attempt to dictate sampling locations. The only functions of some central body of sponsors or advisors is to put together the data sheet, send it out, alert the media and write the resulting report.

What Will Capture the Future?

Where we go from here will be up to the monitors. The Citizens' Volunteer Monitoring Program in collaboration with the Pennsylvania Organization of Watersheds and Rivers and the River Network is going out to the volunteer monitoring community with a Needs Assessment that will drive the formation of the statewide network. An element of the Needs Assessment will delve into the *Snapshot* and how it can be improved to be more meaningful and useful to all who are committed to aquatic resources in Pennsylvania.

Whatever the future of *Watershed Snapshot* - whether it continues in its current form, becomes something else altogether or dies a natural death-it has served its purpose: to capture the tremendous spirit of the outstanding volunteer monitors in Pennsylvania.



EVERYONE INTO THE WATER! ORGANIZING A REGIONAL MONITORING "DAY"

Earth Day Monitoring in Texas: From Seed to Harvest

Volunteers monitor because they want to protect, preserve, and restore environmental integrity for the future. The average volunteer is not privy to the debates of program managers about the complex underpinnings of environmental management strategies. The evidence of their contribution is often hidden from their eyes. A snapshot monitoring event can help demonstrate that they are involved in a great effort - that they are its essential components.

I believe that when we have the opportunity to acknowledge the contribution of our volunteers, and to spotlight the example of stewardship they demonstrate, it is our responsibility to do so. When you consider the benefits of conducting an event that is open to all the water quality monitors in your area, and consider the fact that they can be involved simply by doing what they normally do - only during a selected time frame - it is hard to justify not giving it a try.

On April 22, Earth Day 1999, the volunteer monitors of the Colorado River conducted the first basinwide snapshot monitoring event in Texas. Then, last week, (April 15 – 22, with April 18 as the focal "event day") professional monitors joined volunteer monitors as Southwest Texas State University's Texas Watch coordinated our first statewide snapshot monitoring event in honor of Earth Day 2000. Results from the 1999 event are described in "A Day in the Life of the Colorado River" report, which is available upon request. In short, roughly 300 monitors and 450 total participants joined the 1999 event. Results from this year's event are still being assembled, and Texas Watch intends to produce a summary report of the findings. Preliminary results are posted on the Web, at the address provided in your handout.

My objective is not to try to impress you with numbers of monitors, observers, reporters, locations, water bodies, or stream miles sampled. What I intend to do is to describe for you why I have come to believe that snapshot monitoring can be a unifying force with the potential to strengthen our networks, inspire our monitors, and expand our influence. I must confess, my original goal for this session was to present snapshot monitoring as a proposal for a national event to honor Earth Day 2001. I have since come to recognize that a groundswell of enthusiastic desire to accomplish such an effort must come first. So I will tell you what I think is so great about snapshot monitoring, and you will decide what happens next.

Here are some of the benefits of the 1999 and 2000 Earth Day Snapshot Monitoring Events in Texas:

- Was the first time all volunteer monitoring groups in the Colorado River basin, then in Texas, joined forces in a common monitoring activity.
- In 1999, was the only mention of EARTH DAY on the evening news.
- The 1999 event was covered by roughly 20 local newspapers.
- Introduced 40 something river authority staff to volunteer monitors, who witnessed the effort first hand.
- Afforded office staff at participating agencies the opportunity to get out in the field and see the natural resources they are charged with protecting.
- Generated the Colorado River basin's first comprehensive online volunteer monitoring data set.
- Was enthusiastically embraced by roughly 80% of Colorado River basin monitoring groups.

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For more information:

Texas Colorado River basin Earth Day Results:
www.lcra.org/earthday
contact Steven Hubbell above

Texas Statewide Earth Day 2000 Results:
www.texaswatch.geo.swt.edu
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- Provided an instant inventory of the actual level of volunteer monitoring activity in our watershed.
- Established new alliances and strengthened existing partnerships.
- The 2000 event initiated an actual (as opposed to theoretical) collaboration between professional monitors and volunteer monitors.
- Inspired several volunteer monitors to renew their commitment to collecting and reporting data.
- Afforded a prime opportunity to say “thank you” to all of our volunteers.
- Inspired broad public interest in opportunities available through environmental monitoring.
- Helped identify areas where monitoring gaps and location overlap exist.
- Highlighted strengths and weaknesses of the types of water quality monitoring constituents monitored by volunteers.

How to Begin – A Ten Step Method

While it may seem daunting at first, coordinating a snapshot monitoring event is not as difficult as you may imagine. In fact, our first basinwide snapshot monitoring event was accomplished in ten (more or less) easy steps.

1. Once the decision is made to conduct a basinwide Earth Day event, the first step is to identify the appropriate person who will assume the primary responsibility for making decisions and answering questions as they emerge throughout the process. Without an individual who is unflinchingly committed to the event, many loose threads can unravel.
2. Write a description of the event that clearly articulates its purpose and the process that will be followed to accomplish the purpose. This description can be modified and recycled in subsequent correspondence regarding the event. In our case, the description was used to request monitor involvement, support from monitors’ employers, support from LCRA staff, and support from monitoring partners in the basin. The description was also used in press releases before the event and in the summaries after the fact. Include in this description a strategy to deal with the data your event will generate.
3. Determine what internal or external support will be required to provide sufficient support for the event. Identify the roles to be played and the people who will play these roles. In our case, this meant contacting other monitoring networks within our basin and asking them to invite their monitors to be a part of this event. It also meant asking LCRA staff to commit to visit monitors in action on the day of the event. (This was an internal strategy to increase staff awareness, understandings, and appreciation of volunteer monitors. To see the volunteers in action is powerful persuasion.)
4. Plan to rely on active monitors who are already trained and equipped to conduct water testing. Incorporate the event description into a personal, inspiring, and challenging invitation to each monitoring site. Conclude the invitation by informing monitors that they will receive a phone call to confirm their participation.
5. With the invitation, include a letter requesting support from the monitors’ employers.
6. Build a participant spreadsheet, listing all potential monitoring sites. Include columns for monitor name and phone number, staff name and phone number, monitoring location, monitoring time, and estimated number of participants for each site. Start to fill in this table as you phone each monitor.
7. Call each monitor and partner who received an invitation and say, “So, what time do you plan to monitor with us on Earth Day?” Confirm both the time and the location of their sampling effort. Be sure they have everything they need to conduct their sampling event (fresh reagents, data sheets, miscellaneous supplies). Thank them.
8. If you include site visits with your event, assign monitoring sites to staff. In our case, staff received the name, location, time, and phone number for the monitor they were assigned to support after the monitor agreed to participate.



9. Develop a field checklist to accompany the standard data sheet used by monitors. Our checklist was filled in by staff during the event, and asked for the names of all monitoring participants, a head count of all people present (witnessing as well as participating), the identity of any news organizations represented at the event, and the name of the staff performing the site visit. There was also space for general staff observations, and concerns or needs expressed by the monitors. Whatever questions you want to answer that day, put them on the field checklist and include this as part of the day's required protocol.
10. After the gears are in motion and the date of the event approaches, it is time to publicize the event. Generic press releases and customized local invitations to observe the volunteer monitoring groups are both effective methods of drawing attention to the effort. In our case, we also established a demonstration site where television media could come at noon and 5:00 p.m. to interact with participating students from monitoring schools. There are also numerous web sites where Earth Day event information is solicited.

Following Up: Snapshot Result Summary Ideas (The Report)

You may or may not decide to produce a report of your findings. If you can, it makes the event more meaningful. If you do, you may want to consider including the following information in your report.

- Total # sites monitored
- List of site locations monitored
- List of river basins involved
- List of counties involved
- List of participating partners (agencies, industries, schools, parks, nonprofits, etc.)
- List of monitors
- Map of participating sites
- Total # volunteer monitors participating
- Total # professional monitors participating
- Total # public attending to witness
- Total # watersheds monitored
- Water quality indicator summary (what results are expected, stream standards, what constituents mean, potential pollutant sources – see Delaware “Snapshot” reports for excellent examples)
- Raw data (Spreadsheets on the Web)
- Data summaries – by water quality indicator, by watershed, by ecoregion

Join the discussion – Join the volunteer monitoring list server (it's free!)

To continue the discussion on this topic, or any other topic of interest to volunteer monitors, you are invited to join the volunteer monitoring list server. Here's how:

1. Send an email to: listserver@unixmail.rtpnc.epa.gov
2. Leave the subject line of your message blank. In the message, type: subscribe volmonitor, your last name, your first name.
3. Once you've subscribed, you'll receive a welcome message with instructions on using the list.



Closing Thought

Question: How many monitors would actually make the effort to conduct and report their testing in a specified time frame as part of a nationwide monitoring event?

Answer: We'll never know unless we ask them.



BETTER UNDERSTANDING YOUR WATERSHED THROUGH GIS

SESSION INFORMATION:

Moderator:

Angie Reed, River Network

Presenters:

Bob Craycraft, UNH Cooperative Extension
Community Mapping – Improving Natural Resource Conservation through GIS Technology

Rebecca Boger, The GLOBE Program
GIS in the Schools
(no paper submitted)

Jennifer Fairley, Alabama Water Watch
The AL Water Watch MapInfo Program
(no paper submitted)



BETTER UNDERSTANDING YOUR WATERSHED THROUGH GIS

Community Mapping – Improving Natural Resource Conservation through GIS Technology

Increasing developmental pressures continue to threaten the water quality of our lakes, ponds, and estuarine systems throughout the country. In New Hampshire, for instance, increasing developmental pressures are converting the landscape from a rural, and predominantly forested landscape to a more urban setting characterized by an increase in paved surfaces, well manicured lawns (that include heavy applications of pesticides and fertilizers), and a loss of streamside (riparian) vegetation. Such landscape alterations, from forested to urban setting, often coincide with increasing water quality impairment. During the planning process, municipalities often fail to recognize the many natural resources, and their benefits (i.e.

wetlands, riparian buffers, large contiguous plots of land), that, if properly managed and protected, can minimize the deleterious impacts of development within the watershed and help maintain the integrity of our surface waters.

An intensive two-week summer course called Community Mapping was initiated three years ago by the Cooperative Extension, and offered through the University of New Hampshire Environmental Education Institute. It provides communities with the information and skills necessary to better manage and protect natural resources through the use of Geographical Information System (GIS) technology. The target audience is community leaders and officials who are linked with middle school and high school educators from their respective towns. The hope is that a partnership between decision-maker and educator will be formed to better develop the capacity for GIS-supported natural resources stewardship in their town.

While the original intent of the training was to target specific local decision-makers, we have wound up training a wide range of individuals including:

- Planning Board Members
- Tax Assessors
- Town Engineers
- Town Planners
- Town GIS Technicians
- Master Planners
- Conservation Commissioners
- Building Inspector / Code Enforcement Officers
- Agency Personnel
- Formal and Informal Educators (K-12, Faculty, Nature Center Staff)
- Graduate Students
- Volunteer Monitors in our Great Bay Coast Watch and Lakes Lay Monitoring Program

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The key to the course is that it does not just teach the mechanics of Geographic Information Systems (GIS), but it's instruction and training exercises are in the context of the locally available data for undertaking a community natural resources inventory. Key topics of the natural resources side of the course are:

- Resource Inventory Components and Approaches
- Developing a Resources Protection Plan
- Soil Properties, Characteristics, Importance and Development Implications
- Watersheds, Water Quality & Non-point Source Pollution
- Wetlands, and their Function
- Groundwater and Wellhead Protection Strategies
- Wildlife Habitat
- Buffers for Wildlife and Water Resources Protection
- Critical Lands Analysis
- Voluntary and Regulatory Land Protection Strategies

Participants also gain knowledge in desktop Geographical Information System (GIS) software. The major topics of instruction include:

- Navigating the Software
- Downloading and Importing Data Layers
- Merging Attribute Data
- Data Queries/Selecting by Location
- Geoprocessing (Merging, Buffering, Dissolve, Intersect, Union, Clip)
- Creating New Data
- On Screen Digitizing
- Global Positioning Systems Data Acquisition and Transfer to GIS
- Designing, Creating, and Producing Maps

Participants are given a collection of GIS data specific to their town, which they then use in “hands-on” exercises that follow each daily lecture. By completing these exercises, and undertaking a project selected by the participant, the result is a good start at the compilation of a GIS-based community natural resources inventory.

Participants also become aware of the many sources and availability of the GIS data, the limitations of the GIS data, and how to interpret the GIS products that they and others produce. In addition, they learn about, and often have the chance to interact with, the many cooperators who produce and manage the GIS data, and/or can help support the towns and municipalities who are using GIS data.

Using many of these service provider resources as guest lecturers during the course facilitates these interactions. Cooperators in this effort have included:

- Cooperative Extension Forestry, Wildlife, Water Resources Specialists/Educators



- Natural Resources Conservation Service Engineers/Scientists
- NH Natural Heritage Inventory Staff
- State / Regional Planning Agency Staff
- NH Fish and Game Educators
- NH Dept. of Environmental Services Personnel
- GRANIT (NH GIS Data Depository) Data Manager
- Environmental Consultants

The results have been quite remarkable for such a short course. Teachers from several high schools have incorporated a GIS component into their curriculum. GIS has been used by one of our teachers to entice at-risk students to stay in school. One of these students has gone on to enroll in a GIS program at a technical college. Students have assisted towns with resource inventory maps and in developing trails on town lands. Our decision-maker participants are better able to communicate with GIS professionals and cooperators. Most of these are comfortable and knowledgeable about asking other cooperators and providers for the appropriate data and GIS products, and many are able to support some of their own, and town, GIS needs as well. Local towns are using GIS in their planning process, including using the natural resources inventory to formulate or update their Master Plans. Local towns are also using the GIS maps that participants produced for town board, committee, and public sessions. The course has also provided a venue for networking between town educators and decision-makers, which has led to the formation of watershed partnerships, greenway alliances, and other inter-town collaborations.